

Notice of Allowability

Application No.

10/510,529

Examiner

Nikita Wells

Applicant(s)

GRIER ET AL.

Art Unit

2881

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Application filed 7 October 2004 and Preliminary Amendment received 3 December 2004.
2. ☒ The allowed claim(s) is/are 1-60.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
(a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
(b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

Nikita Wells
Primary Examiner
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DETAILED ACTION

Allowable Subject Matter

1. Claims 1-60 are allowed.
2. The following is an examiner's statement of reasons for allowance:

With respect to the independent claim 1, prior art fails to disclose or make obvious an apparatus for trapping small particles by forming optical traps, comprising: a first phase patterning optical element for receiving a laser beam and to impart a selected cross section to the wavefront of the laser beam; a second phase patterning optical element downstream from the first phase patterning optical element for receiving a laser beam and forming at least two beamlets; and, a focusing lens with a front and a back aperture disposed downstream from the second phase patterning optical element; whereby the second phase patterning optical element in cooperation with the focusing lens can separately converge beamlets and establish the gradient conditions to form optical traps capable of manipulating small particles.

With respect to the independent claim 23, prior art fails to disclose or make obvious an apparatus for trapping small particles by forming optical traps, comprising: a phase patterning optical element for receiving a laser beam and to impart a square cross section to the wavefront of the laser beam; at least one computer; a dynamic phase patterning optical element with a variable surface encoded, by the computer, with a hologram for receiving a laser beam from the phase patterning optical element; whereby movable beamlets can be formed from a received laser beam; and, an objective lens with a front and a back aperture disposed downstream from the dynamic phase patterning optical element; whereby the dynamic phase patterning optical

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element in cooperation with the objective lens can separately converge beamlets and establish the gradient conditions to form optical traps capable of manipulating small particles.

With respect to the independent claims 34, 37, and 45, prior art fails to disclose or make obvious a method for trapping or manipulating small particles with optical traps, comprising: generating a modified laser beam by imparting a selected cross section to the wavefront of a laser beam direct at a first phase patterning optical element; generating at least two beamlets by directing the modified laser beam at a second phase patterning optical element; generating optical traps within a vessel by directing the beamlets through a focusing lens; providing at least two small particles within the vessel; and continuing at least one small particle within an optical trap.

The dependent claims 2-22, 24-33, 35-36 and 60, 38-44, 46-59, are allowable by virtue of their dependence upon the independent claims 1, 23, 34, 37, and 45, respectively.

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Grier et al. (6,055,106 and 2004/0207922 A1) disclose a method and apparatus which makes use of a diffractive optical element receiving a laser beam and forming a plurality of light beams which are operated on by a telescope lens to create an array of optical traps for manipulating small dielectric particles.

4. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

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5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikita Wells whose telephone number is (571) 272-2484. The examiner can normally be reached on 8:30 AM - 5:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on (571) 272-2477. The central fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

6. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Nikita Wells, Primary Examiner
Art Unit 2881
March 28, 2006